CORRESPONDENCE/MEMORANDUM

State of Wisconsin

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SUBJECT: Portage County Landfill - Monitoring Results

Background

The Portage County Landfill, located in the Township of Stockton, is approximately 10 miles west of Steven Point along Hwy QQ. The landfill is situated in rural surroundings. The terrain of the landfill and the nearby surrounding area are characterized by rolling hills

The landfill began operations in 1982 accepting primarily municipal solid waste. The landfill currently receives 30,000 tons of municipal waste each year and the now has approximately 15.3 acres of waste in place. Closed cells in the landfill have been covered and a gas extraction system is place at the landfill. The landfill gas is collected and burned in a flare. While a gas extraction system is in operation there is still gas leakage from the site. Leakage occurs near areas were the final cover is not yet in place and near the leachate collection system. This leakage is noted by the "sour" landfill gas odor.

Beginning in approximately 1997 the residents near the site began noticing odorous emissions escaping from the landfill. In some instances the surrounding terrain inhibits air mixing and prevents the dispersion of odors. The occurrence of odorous emissions and the complaints from residents have continued to the present. The Department was asked to conduct gas testing and air monitoring at the facility to determine if any of the emissions might pose a threat to the nearby resident's health. The monitoring objectives for the study were to conduct a comprehensive monitoring survey of landfill gases at the Portage County Landfill. The monitoring attempted to measure hazardous compounds in the landfill gas and to estimate possible releases of that gas at the facility. Air monitoring is not able to estimate emissions associated with the exposed garbage from the active face of the landfill.

Monitoring was conducted at the facility on June 21 and 22. Follow-up monitoring was conducted on September 22. This memorandum summarizes the monitoring results from all monitoring activities.

Monitoring Results

Monitoring operation at the landfill was conducted according to the draft Monitoring plan issued 6/1/2000. That plan monitoring was to be conducted at a minimum of four locations which were to include; the gas extraction system, a gas well on the closed area of the landfill, fugitive emissions from a break in the landfill cover, at a down-wind fence-line location. Monitoring on June 21/22 included the collection of samples at all these locations. Monitoring on September 22 consisted of collection only from the gas extraction system and on-site fugitive emissions. In the time interval between the initial and the follow-up monitoring a number of changes were made to the landfill. An intermediate cover was placed on the eastern area of the landfill which had been active during

the June monitoring period. The active face of the landfill was now located on the western side of the site. The monitoring results are summarized on Tables 1- 4.

Discussion of Results

The landfill gas extraction system is the most important point for the emission of landfill gas at the Portage County Landfill. This monitoring project collected a number of samples from the gas extraction system to develop an understanding of the compounds present in the landfill gas. The initial testing of the landfill gas conducted in June detected 13 individual compounds and the summed concentration for two compounds groups (petroleum distillates and napha). Gas samples for these measurements were collected from the gas extraction system at a port before the gas flare. Separate gas samples were collected to monitor hydrogen sulfide. The hydrogen sulfide could not be analyzed due to an error made at the laboratory. I was unable to make any direct measurements of the gas flow during this monitoring session because the sampling port was too small for my equipment. During follow up monitoring in September, I was able to collect valid samples for Volatile Organic Compounds and for hydrogen sulfide. During the follow-up monitoring I was able to make gas flow measurements from a larger port located closer to the mechanical blowers. This second set of data showed 23 compounds and 2 compounds groups (petroleum distillates and napha) in the landfill gas. The gas samples were collected directly from the source of emissions and the presence of multiple compounds in high concentrations made it difficult to make definitive measurements of the detected VOCs. The laboratory therefore reported the compounds present and then reported the maximum possible concentrations. The laboratory was able to make a more definitive measurement of the hydrogen sulfide concentrations. Having both the gas concentrations and the gas flow data I developed theoretical emission rates for untreated landfill gas. Emission data is reported in Table 5 of this report. The reader should note that gas at the Portage County landfill is combusted in a flare. Of the 23 compounds 14 are regulated under the Wisconsin DNR's NR445 rules. All 14 compounds are less than the current deminus limits[1] set forth in NR445.

The second monitoring location was to be at a gas well. Monitoring at the gas well was intended to examine any differences between the gas at the well and the gas at the blower. Gas testing during June showed no measurable compounds in the gas well sample. During the follow-up monitoring in September I made a measurement of the vacuum at both the up and down stream test points of the gas well. A test on a gas well in the close area of the landfill showed a vacuum of 2.6 to 2.7 inches of water. This vacuum will interfere with the collection of gas at the well and is the most likely reason no compounds were detected in the well gas. No gas well sampling was conducted on the follow-up monitoring.

Survey measurements of fugitive emission did show that low concentrations of hydrogen sulfide were leaking from manholes and from leachate leaks. The survey also showed that the fugitive leaks were quickly diluted to non-measurable concentrations.

One ambient sample was collected during the June sampling period. The sampling conditions were not ideal for the ambient collection but they were the best available and the sample was analyzed for

[1] The deminimus limit has been determined by a modeling analysis of a generic stack less than 25 feet in height. The limit is calculated as the emission rate at which the ambient concentration is less that 2.4% of the ACGIH TLV concentration at the point of maximum impact. For stacks less than 25 feet in height the maximum impact point for a 24-hour time period is located approximately 20 meters from the stack. This maximum impact point would be within the landfill boundary.

any compounds that might be present. Results showed only a few compounds were detected. Two of the tested compounds, acetylene and toluene are commonly detected and may originate from sources other than the landfill.

Conclusions:

Sampling of the landfill gas from the gas extraction system has shown that the landfill gas does carry detectable concentrations of hazardous compounds. The emission rates (calculated as maximum possible emissions) for these hazardous compounds are below the limits regulated by the Wisconsin DNR's NR445 rule. The gas extraction system at the Portage County landfill burns the gas in a flare, which should reduce or eliminate the concentrations of the hazardous compounds.

Measurement at the emission source provides the best means of detecting and quantifying compounds that may be present in the landfill gas. The testing done at the landfill has shown that even uncontrolled the hazardous compounds found in the landfill gas are present at low concentrations and are not subject to regulation.

Table 1: Portage County Landfill Gas Concentration Data for Samples Collected 6/21/00 & 6/22/00					
Sample Number	PCL00-001	PCL00-003	PCL00-005	PCL00-008	PCL00-009
Location	Extraction Blower	Gas Well	Extraction Blower	Extraction Blower	Extraction Blower
Compound Name	mg/m3	mg/m3	mg/m3	mg/m3	mg/m3
Acetone	18.4	ND	15.3	18.5	16.7
Isopropanol	9.4	ND	7.7	7.8	7
Ethanol	47.1	ND	38.3	34.4	30.7
A-Pinene	29.4	ND	25.3	27.8	23
Toluene	28.6	ND	27	28.5	24.4
B-Pinene	6.7	ND	5.7	5.9	4.8
Ethyl Benzene	24.7	ND	20.7	25.2	20
Xylene	57.6	ND	49	58.1	45.9
Limonene	9	ND	10	9.6	6.3
1,3,5-Trimethylbenzene	2.4	ND	2.2	2.4	1.7
1,2,4-Trimethylbenzene	3.8	ND	3.7	4.1	2.5
1,2,3-Trimethylbenzene	0.8	ND	0.8	0.9	0.5
P-Dichlorobenzene	1.2	ND	1.4	1.4	0.7
Petroleum Distillates	443.1	ND	363.3	448.1	374.1
Naphtha	36.5	ND	36.7	39.3	24.8
Vinyl Chloride	ND	ND	ND	ND	ND
Sample Number	PCL00-002	PCL00-004	PCL00-006		
Location	Extraction	Extraction	Gas Well		
Compound Name	mg/m3	mg/m3	mg/m3		
Hydrogen Sulfide	LabError	LabError	LabError		
LabError – sample data was lost due to analysis error at the laboratory. “ND” – indicated no compound was detected.					

Table 2: Portage County Landfill Gas Concentration Data for Samples Collected 9/22/00			
Sample Number	PCL92202		
Location	Extraction Blower		
Compound Name	mg/m3		
Hexane	<=17		
Acetone	<=34		
Methy Ethyl Ketone	<=61		
Octamethylcyclotetrasiloxane	<=51		
Isopropyl Alcohol	<=22		
Ethyl Alcohol	<=43		
Methylene Chloride	<=44		
Benzene	<=19		
A-Pinene	<=56		
Perchloroethylene	<=41		
Toluene	<=91		
Decamethylcyclopentasiloxane	<=35		
B-Pinene	<=14		
Ethyl Benzene	<=38		
Butyl Alcohol	<=47		
Xylene	<=90		
Isopropylbenzene	<=4		
Limonene	<=25		
135-Trimethylbenzene	<=4		
Styrene	<=4		
124-Trimethylbenzene	<=7		
123-Trimethylbenzene	<=2		
Dichlorobenzene	<=4		
Vinyl Chloride	ND		
Petroleum Distillates	563		
Naphtha	84		
Sample Number	PCL922-01	PCL922-02	PCL922-03
Location	Extraction Blower	Extraction Blower	Extraction Blower
Compound Name	mg/m3	mg/m3	mg/m3
Hydrogen Sulfide	94.2	91.2	85.3
The “<=” symbol indicates that another compound or other compounds interfered with the measurement of the compound. The compound is reported as being present at a concentration equal to or less than the reported value. This means that the reported concentration is the maximum possible concentration of the compound in that sample.			

Table 3: Ambient Air Results for a Sample Collected 6/22/00	
Compound Name	Concentration ppb
1,1,1-Trichloroethane	0.14
Acetylene	0.16
Toluene	0.13
Cis-1,3-Dichloropropene	ND
Trans-1,3-Dichloroethene	ND
1,4-Dichlorobenzene	ND
Dibromochloromethane	ND
1,2-Dichloropropane	ND
Bromodichloromethane	ND
Trichloroethene	ND
1,1,2-Trichloroethane	ND
Bromomethane	ND
1,1,2,2-Tetrachloroethane	ND
1,2-Dichloroethane	ND
Chloroprene	ND
Chloroethane	ND
Bromoform	ND
Carbon Tetrachloride	ND
Chloroform	ND
Methylene Chloride	ND
N-Octane	ND
1,3-Butadiene	ND
Propene	ND
Tetrachloroethene	ND
Chlorobenzene	ND
Cis-1,3-Dichloropropene	ND
Isopropylbenzene	ND
Vinyl Chloride	ND
Ethylbenzene	ND
Styrene	ND
O-Xylene	ND
Benzene	ND
1,2-Dichlorobenzene	ND
M/P-Xylene	ND
1,3-Dichlorobenzene	ND
Chloromethane	*I <0.5
"ND" – indicated no compound was detected. Detection limits for this test range from 0.05 to 0.1 ppb. "I" – indicates and interference was present.	

Table 4: Fugitive Gas Survey at the Portage County Landfill		
Date	Location	Results
6/22/00	West side of the landfill near the active face of the landfill	Hydrogen sulfide was detected near the leachate streams (1-6" from stream surface) at concentration of 0.001-0.117 ppm. While the streams were emitting hydrogen sulfide the concentration was being diluted and no hydrogen sulfide was detected at the breathing level (~5 ft.).
9/22/00	Manhold case located directly to the north of the gas extraction blower system. I noted odors downwind of the manhole and conducted a hydrogen sulfide survey	▪ Upwind 0.001 ppm, ▪ Five feet downwind of the manhole 0.050 ppm, ▪ On top of the manhole 0.014 to 0.063 ppm, and ▪ Again upwind of the manhole 0.002 ppm.
9/22/00	I re-surveyed hydrogen sulfide concentrations on the west side of the landfill near points of leaking leachate	Concentrations ranged from 0.001 to 0.008 ppm. This included measurements direct over bubbly gas leaks (0.008 ppm) and near area with a noticeable odor (0.003 ppm
All measurements were conducted with a real-time hydrogen sulfide monitor.		

Table 5: Estimated Emission from Landfill Gas Extraction System (if unflared)					
Compound Name	Emissions (pounds/ hour)	Emissions (pounds/ year)	Regulated under NR445 Table	NR445 Limit	NR445 Emission units
Dichlorobenzene	0.00330693	29	1	1.5624	lb/hour (as p-isomere)
Styrene	0.00330693	29	1	17.90604	lb/hour
Hexane	0.01410959	124	1	14.99904	lb/hour
Ethyl Benzene	0.03152611	276	1	36.228	lb/hour
Perchloroethylene	0.03417166	299	1	27.9	lb/hour
Methylene Chloride	0.03659674	321	1	29.148	lb/hour
Butyl Alcohol	0.03902183	342	1	7.596	lb/hour
Xylene	0.07473672	655	1	36.228	lb/hour
Toluene	0.07561857	662	1	31.2312	lb/hour
123-Trimethylbenzene	0.0017637	15	4	10.4112	lb/hour
135-Trimethylbenzene	0.00330693	29	4	10.4112	lb/hour
Isopropylbenzene	0.00330693	29	4	20.4048	lb/hour
124-Trimethylbenzene	0.00573202	50	4	10.4112	lb/hour
Hydrogen Sulfide	0.07503268	657	4	1.1664	lb/hour
Benzene	0.01587329	139	3(A)	300	lb/year
B-Pinene	0.0116845	102	not regulated		
Isopropyl Alcohol	0.01829837	160	not regulated		
Acetone	0.02821917	247	not regulated		
Decamethylcyclopentasiloxane	0.02910102	255	not regulated		
Ethyl Alcohol	0.03571489	313	not regulated		
Octamethylcyclotetrasiloxane	0.04232876	371	not regulated		
A-Pinene	0.04651755	407	not regulated		
Methyl Ethyl Ketone	0.05070633	444	not regulated		
Naphtha	0.06988655	612	not regulated		
Petroleum Distillates	0.46826193	4102	not regulated		
Limonene	0.02072346	182	not regulated		
The emission rates reported here were calculated for the gas concentration reported in Table 2. Most of the concentrations are the maximum possible concentration in the gas. Therefore the emission rate would also be the maximum possible emission rate.					